

**2016 Cobra Invitational**  
**Saturday, January 30, 2016**  
**Birmingham Covington School**

**REACH FOR THE STARS**

**KEY**

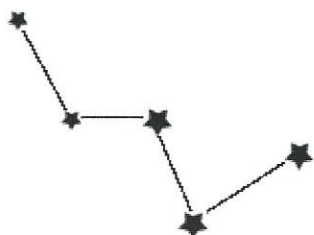
Page 1:	Constellations Correct	_____ X 5 = _____	possible 30 pts
	Stars/Deep Sky objects	_____ X 2 = _____	possible 16 pts
Page 2:	Constellations Correct	_____ X 5 = _____	possible 35 pts
	Stars/Deep Sky objects	_____ X 2 = _____	possible <sup>14</sup> <del>12</del> pts
Page 3:	Correct Answers	_____ X 2 = _____	possible 36 pts
Page 4:	Correct Answers	_____ X 2 = _____	possible 12 pts
Page 5:	Correct Matches	_____ X 3 = _____	possible 30 pts
Page 6:	Correct True/False	_____ X 2 = _____	possible 24 pts
		TOTAL _____	possible <sup>87</sup> <del>195</del> pts

TIE BREAKER #1 Correct? Page 6 (TRUE/FALSE Helix Nebula #10)

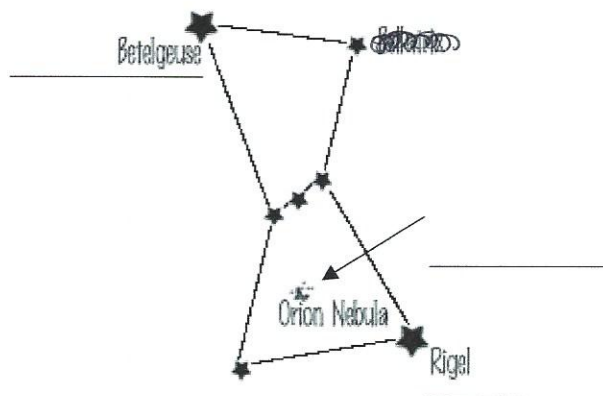
TIE BREAKER #2 Correct? Page 1 identified Pollux star on Gemini constellation

TIE BREAKER #3 Correct? Page 5 #4

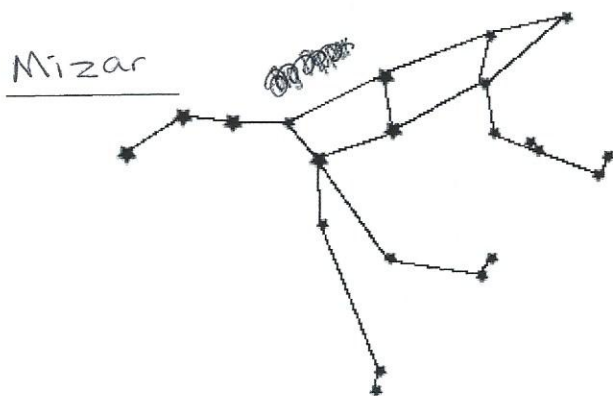
PART 1: Identify the following Constellations and fill in the blanks (stars of deep sky objects). 5 points for each constellation identified correctly and 2 points for each star or deep sky object correctly labeled.



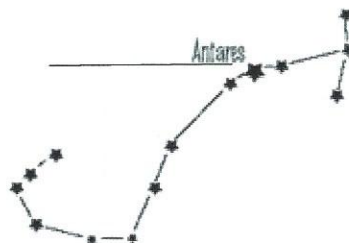
Constellation Name: Cassiopeia



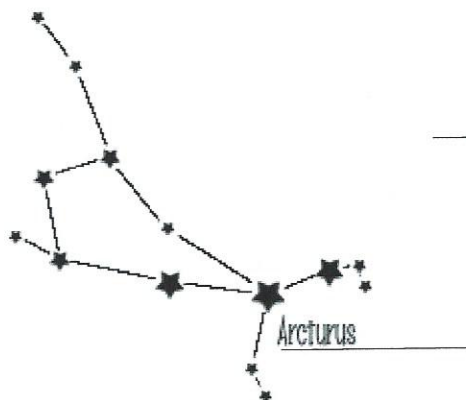
Constellation Name: Orion



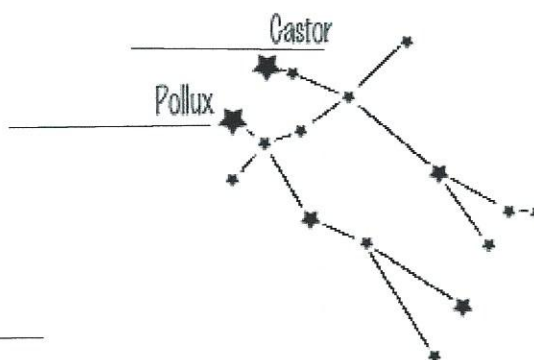
Constellation Name: Ursa Major



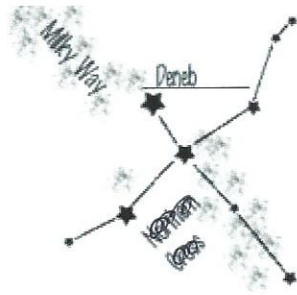
Constellation Name: Scorpius



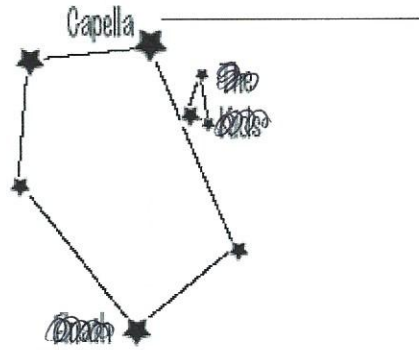
Constellation Name: Bootes



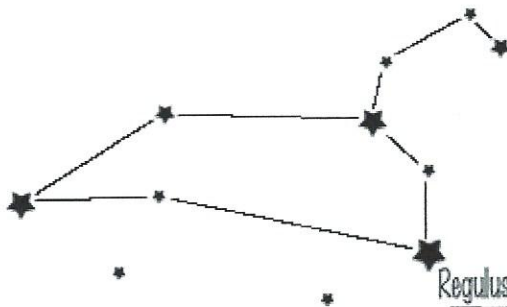
Constellation Name: Gemini



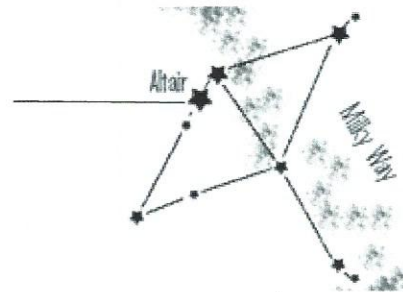
Constellation Name: Cygnus



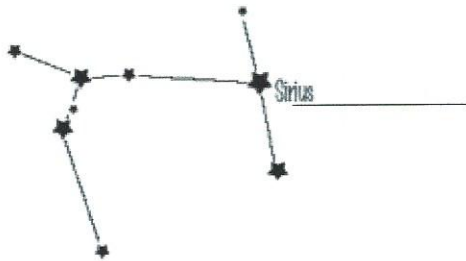
Constellation Name: Auriga



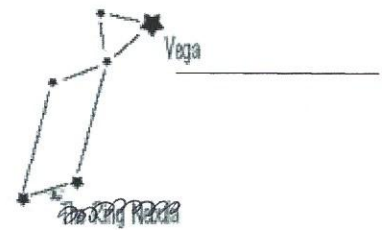
Constellation Name: Leo



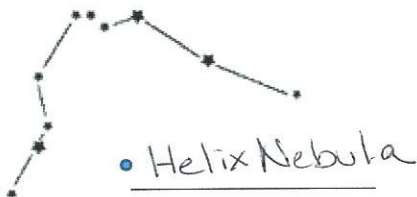
Constellation Name: Aquila



Constellation Name: Canis Major



Constellation Name: Lyra



Constellation Name: Aquarius

PART 2:

1/ Complete the missing phases in the life cycle of an average star. (2 points each)

Average Star → Red Giant → <sup>Planetary</sup> Nebula → white dwarf

2/ Complete the missing phases in the life cycle of a massive star. (2 points each)

Massive Star → <sup>Red</sup> Supergiant → Supernova → Neutron star  
 ↘ Black hole

3/ Identify the following Star's Spectral Class: (2 points each)

### Spectral Class Characteristics

Spectral Class	Intrinsic Color	Surface Temperature (K)	Prominent Absorption Lines
O	Blue	41,000	He <sup>+</sup> , O <sup>++</sup> , N <sup>++</sup> , Si <sup>++</sup> , He, H
B	Blue	31,000	He, H, O <sup>+</sup> , C <sup>+</sup> , N <sup>+</sup> , Si <sup>+</sup>
A	Blue-white	9,500	H(strongest), Ca <sup>+</sup> , Mg <sup>+</sup> , Fe <sup>+</sup>
F	White	7,240	H(weaker), Ca <sup>+</sup> , ionized metals
G	Yellow-white	5,920	H(weaker), Ca <sup>+</sup> , ionized & neutral metal
K	Orange	5,300	Ca <sup>+</sup> (strongest), neutral metals strong, H(weak)
M	Red	3,850	Strong neutral atoms, TiO

Star	Spectral Class	Star	Spectral Class
Aldebaran	<u>K</u>	Rigel	<u>B</u>
Antares	<u>M</u>	Sirius	<u>A</u>
Arcturus	<u>K</u>	Spica	<u>B</u>
Betelgeuse	<u>M</u>	Sun	<u>G</u>
Capella	<u>G</u>	Vega	<u>A</u>
Procyon	<u>F</u>		

4/ Place the following stars/deep sky objects on the H-R Diagram. (2 points each)

A – Sirius B – a white dwarf with luminosity of  $0.03L$  and Spectral Class A.

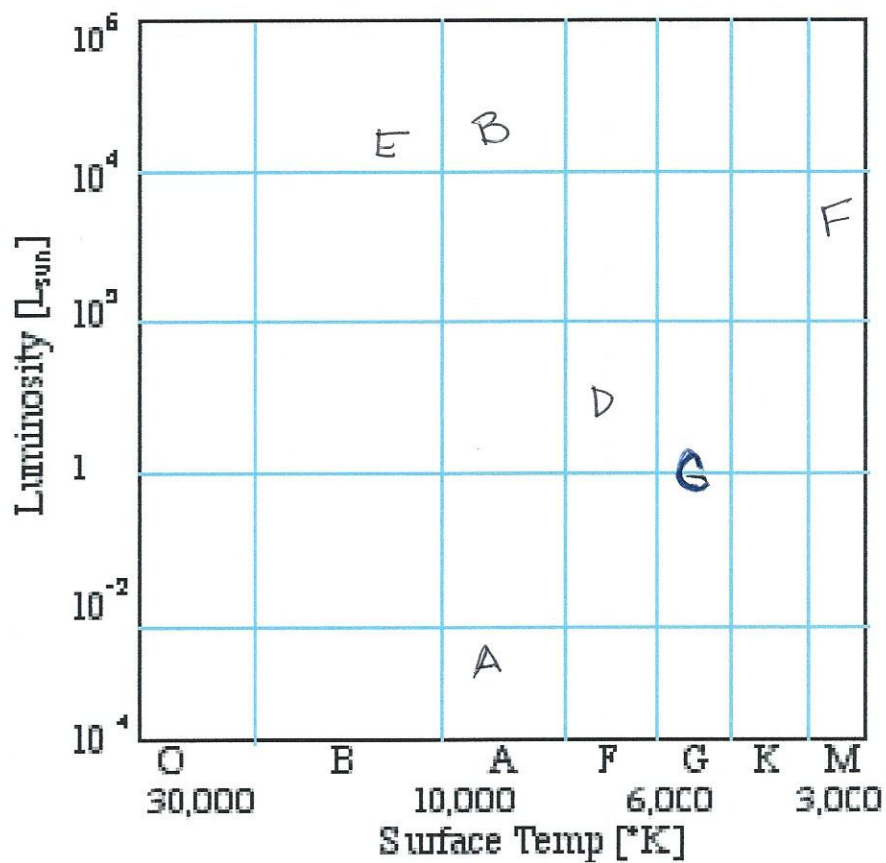
B – Deneb – Brightest star in the constellation Cygnus. Spectral type A2 with luminosity of  $196,000L$

C – Sun – The star at the center of our solar system. Spectral Class G with luminosity of  $1L$

D – Altair – Brightest star of the Eagle. Spectral Class A with luminosity of  $10.6L$

E – Rigel – A blue giant with surface temperature of  $11,000\text{Kelvin}$  and luminosity of  $66,000L$

F – Gamma Crucis – Nearest red giant to the Sun, Spectral Class M and luminosity of  $1,500L$





Name: \_\_\_\_\_

**Question 5 (3 points each)**

Write the letter of the correct match next to each problem.

- |     |                              |                     |   |
|-----|------------------------------|---------------------|---|
| 1.  | <u>          c          </u> | Gamma Ray           | a. the distance which a ray of light would travel in one year.  |
| 2.  | <u>          a          </u> | Light Year          | b. the brightness of a star as seen from earth  |
| 3.  | <u>          d          </u> | Neutron Star        | c. Extremely short-wavelength and energetic electromagnetic radiation.  |
| 4.  | <u>          i          </u> | Supernova           | d. The remnants of a dead star.   |
| 5.  | <u>          g          </u> | main sequence       | e. total amount of energy emitted by a star, galaxy, or other astronomical object per unit time                           |
| 6.  | <u>          j          </u> | absolute brightness | f. patterns of stars  |
| 7.  | <u>          b          </u> | apparent brightness | g. a diagonal area on an H-R diagram that includes more than 90 percent of all stars                                      |
| 8.  | <u>          f          </u> | constellation       | h. developing star not yet hot enough to engage in nuclear fusion   |
| 9.  | <u>          h          </u> | protostar           | i. a star that suddenly increases greatly in brightness because of a catastrophic explosion that ejects most of its mass. |
| 10. | <u>          e          </u> | luminosity          | j. the brightness a star would have if it were at a standard distance from earth  |

6/ True/False – Indicate whether each statement is true (T) or false (F). 2 points each.

\_\_\_\_\_ Supergiants are brighter than giants. TRUE

\_\_\_\_\_ White Dwarfs are colder than red supergiants. FALSE

\_\_\_\_\_ Star temperatures are measured in Celsius on an H-R Diagram. FALSE

\_\_\_\_\_ All giant stars are red. FALSE

\_\_\_\_\_ The **distance modulus** is the difference between the apparent magnitude (ideally, corrected from the effects of interstellar absorption) and the absolute magnitude of an astronomical object. TRUE

\_\_\_\_\_ Stars are deep sky objects. FALSE

\_\_\_\_\_ White Dwarf Stars are part of the main sequence on an H-R Diagram. FALSE

\_\_\_\_\_ Stars are always evolving. TRUE

\_\_\_\_\_ A Nebulae is a cloud of dust and gases. TRUE

\_\_\_\_\_ Helix Nebula is a deep sky object part of the constellation Aquarius. TRUE TIE

\_\_\_\_\_ Blue Dwarf Stars have a higher Luminosity than Blue Supergiant Stars. FALSE

\_\_\_\_\_ The **electromagnetic spectrum** describes all the wavelengths of light. TRUE